CLAIMS

What is claimed is:

1. A plasma reactor comprising:

a chamber having a process gas inlet and enclosing a plasma process region;

a workpiece support pedestal within said chamber capable of supporting a workpiece at a processing location interfacing with said plasma process region, said support pedestal and said chamber defining an annulus therebetween to permit gas to be evacuated therethrough from said plasma process region; and

a ring horseshoe magnet adjacent and about one side of the annulus, said magnet being spaced from said plasma processing location by a spacing substantially greater than the smallest distance across said annulus, said magnet defining opposite poles which are substantially closer together than said spacing of said magnet from said processing location, said magnet oriented to provide its maximum magnetic flux across said annulus and a minimum of said flux at said plasma processing location.

2. A plasma reactor comprising:

a chamber having a process gas inlet and enclosing a plasma process region;

a workpiece support pedestal within said chamber capable of supporting a workpiece at a processing location interfacing with said plasma process region, said support pedestal and said chamber defining an annulus therebetween to permit gas to be evacuated therethrough from said plasma process region;

a ring horseshoe magnet adjacent and about one side of the annulus, said magnet being spaced from said plasma processing location by a spacing substantially greater than the smallest distance across said annulus, said magnet defining opposite poles which are substantially closer together than said spacing of said magnet from said processing location, said magnet being oriented to provide its maximum magnetic flux across said annulus and a minimum of said flux at said plasma processing location;

said opposite poles being spaced similarly to or closer together than said smallest distance across said annulus.

3. The reactor of Claim 2, in which the magnetic flux across the annulus from the magnet is greater by at least an order of magnitude than that the processing location.

4. The reactor of Claim 3, in which the magnet comprises at least one ring magnet, with the remainder of the horseshoe being of magnetically permeable material.

5. The reactor of Claim 2, in which the magnet is located adjacent a narrowest portion of the annulus.

6. The reactor of Claim 2, in which the magnet is located within the pedestal.

7. The reactor of Claim 2 wherein said magnet arrangement is adjacent an inner radius side of the annulus.

8. The reactor of Claim 2 wherein said magnet arrangement is adjacent an outer radius side of the annulus.

9. A plasma reactor comprising:

a chamber having a process gas inlet and enclosing a process region;

a workpiece support pedestal capable of supporting a workpiece at a processing location interfacing with said process region, said support pedestal and said chamber defining an annulus therebetween to permit gas to be evacuated therethrough from said process region;

a ring horseshoe magnet adjacent and about one side of the annulus and oriented to provide its maximum magnetic flux across said annulus and a minimum of said flux at said processing location, said horseshoe magnet being displaced from said processing location by a distance substantially greater than the smallest distance across said annulus.

10. A plasma reactor comprising:

a chamber having a process gas inlet and enclosing a process region;

a workpiece support pedestal capable of supporting a workpiece at a processing location interfacing with said process region, said support pedestal and said chamber defining an annulus therebetween to permit gas to be evacuated therethrough from said process region;

a ring horseshoe magnet adjacent and about one side of the annulus and oriented to provide its maximum magnetic flux across said annulus and a minimum of said flux at said processing location, said horseshoe magnet being displaced from said processing location by a distance substantially greater than the smallest distance across said annulus;

wherein the spacing between opposing poles of said horseshoe magnet is substantially less than the distance of said horseshoe magnet from the processing location.

11. A plasma reactor comprising:

a chamber having a process gas inlet and enclosing a process region;

a workpiece support pedestal capable of supporting a workpiece at a processing location interfacing with said process region, said support pedestal and said chamber defining an annulus therebetween to permit gas to be evacuated therethrough from said process region;

a ring horseshoe magnet adjacent and about one side of the annulus and oriented to provide its maximum magnetic flux across said annulus and a minimum of said flux at said processing

location, said horseshoe magnet being displaced from said processing location by a distance substantially greater than the smallest distance across said annulus;

wherein the spacing between opposing poles of said horseshoe magnet is substantially less than the distance of said horseshoe magnet from the processing location and is similar to or less than said smallest distance across said annulus.

12. The reactor of Claim 11 wherein:
said annulus is defined by opposed chamber and pedestal walls; and
said horseshoe is located within one of said walls.